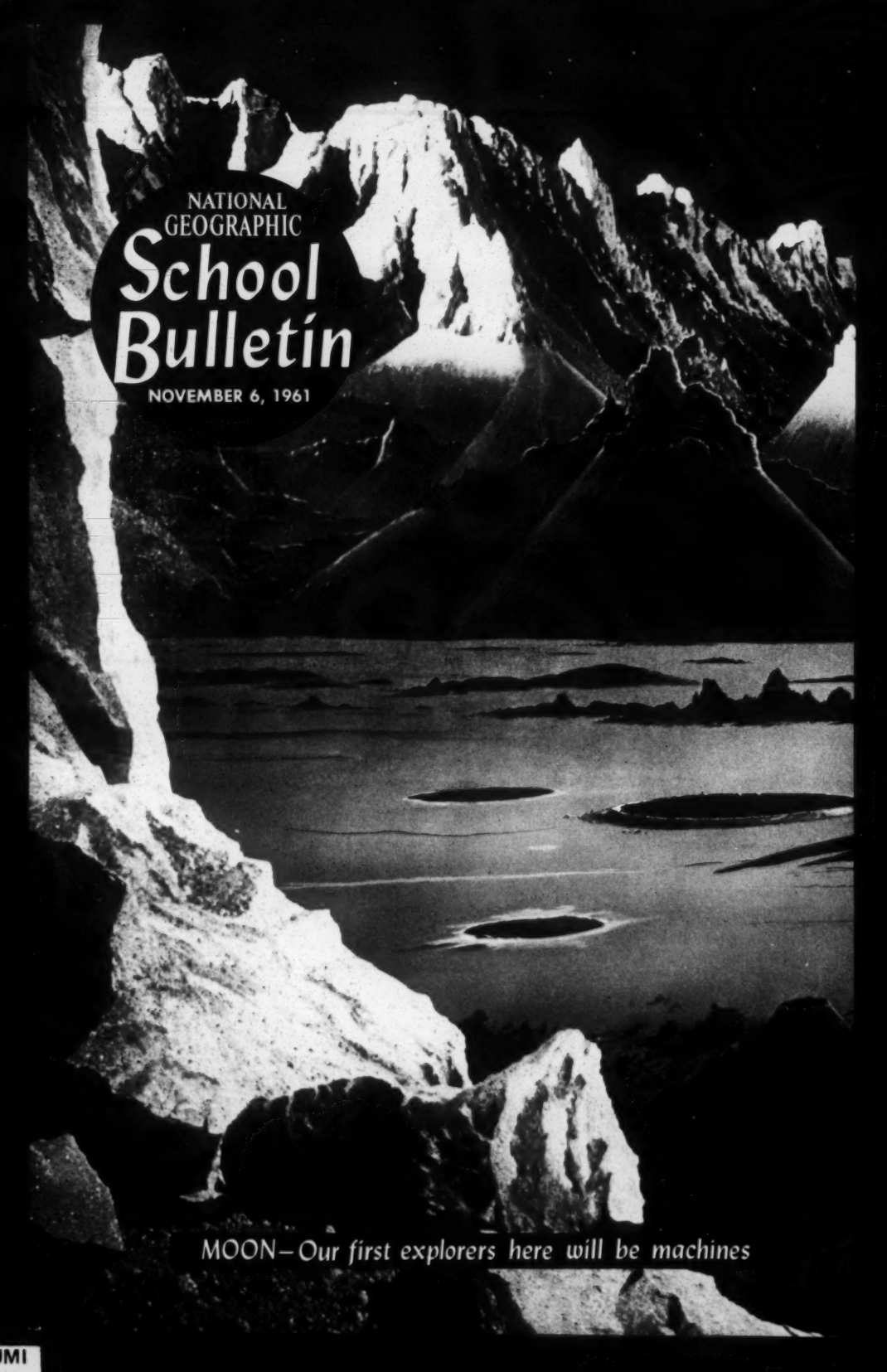
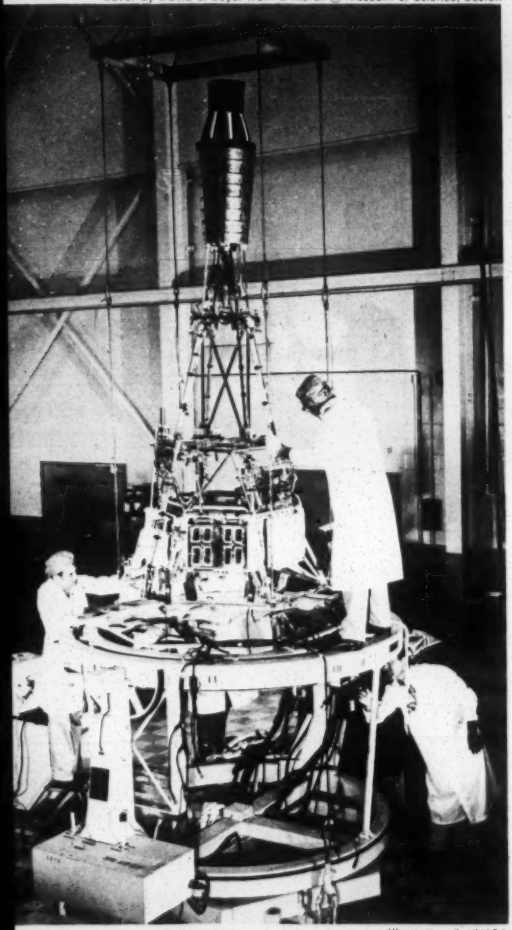

NATIONAL
GEOGRAPHIC
School
Bulletin
NOVEMBER 6, 1961
MOON—Our first explorers here will be machines

PROJECT RANGER

Shooting for the Moon

Cover by David S. Boyer from a mural © Museum of Science, Boston



Illustrations by NASA

SPACE TECHNICIANS, dressed like doctors to avoid getting dust on the delicate machine, put together the *Ranger II* in Pasadena, California. Similar craft will carry the first United States instruments to the moon.

TODAY'S Columbus is a machine.

In the greatest exploration man has yet made—to the moon and beyond—weird pieces of hardware will go first to discover what lies ahead.

It is as if Christopher Columbus had walked down to the dock and told the ship *Santa Maria:* "I think we can get to Cathay by sailing west. Go find out," and the ship had sailed off with not a man aboard and done just that.

There are advantages and disadvantages in this machine approach.

No machines yet made can rival man as an explorer. They cannot see and learn all that he can.

The biggest advantage can be seen if we suppose that Columbus had been wrong. Suppose the Earth *were* flat. Then the *Santa Maria* might very well have sailed off the edge—as some people believed it would. But Columbus would have remained safe on the pier.

There are dangers in space travel worse than the sea monsters that Columbus's crew were so frightened of.

To find out what the dangers are and to protect future travelers from them, we send out satellites, deep space probes—and soon, machines to land on the moon. These will tell us by radio what the moon is like, and what we'll have to do to live there safely. For example, can men survive under the rays of the sun without the protective atmosphere of

Continued on page 64

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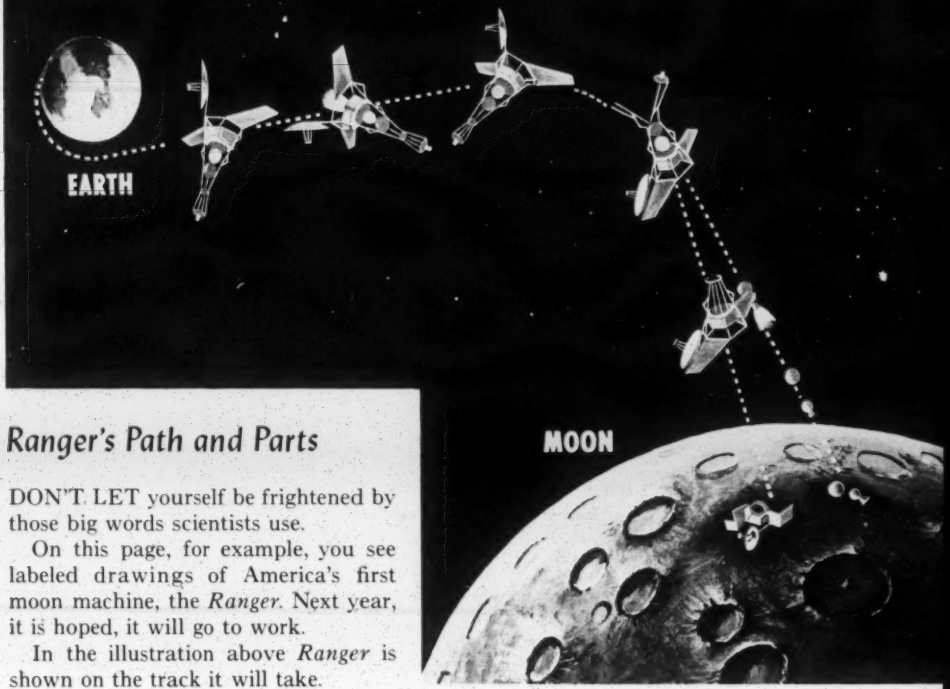


Ranger's Path and Parts

DON'T LET yourself be frightened by those big words scientists use.

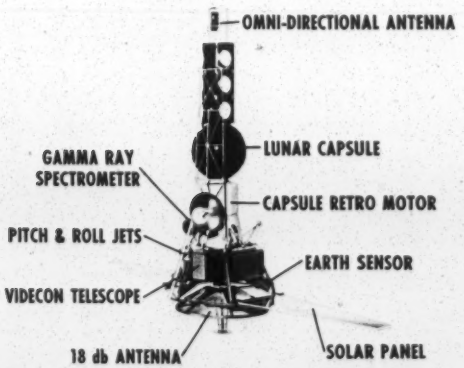
On this page, for example, you see labeled drawings of America's first moon machine, the *Ranger.* Next year, it is hoped, it will go to work.

In the illustration above *Ranger* is shown on the track it will take.

Its parts are named below. They are not as complicated as they seem. For example, the *omni-directional antenna* is simply a radio that receives and broadcasts in all directions.

The *18 db antenna* on the bottom is a stronger radio sender, and is designed to point toward Earth throughout the flight. (db is the abbreviation for decibel, the measure of sound.)

The antenna is told where to point by the *Earth sensor,* which "senses" Earth with cells that "see" the sunlight reflected from it.



The *videcon telescope* is a television camera. As the device speeds toward the moon it will broadcast to Earth the clearest pictures of the moon's surface ever taken.

While the camera buzzes, the *gamma ray spectrometer* will measure and analyze the moon's radiation to reveal what elements it is made of.

Ranger will be kept in the proper position by the *pitch and roll jets*—jets of compressed gas that automatically straighten it out if it starts to tumble.

All equipment is powered by the *solar panels,* which catch sunlight and turn it into electricity.

Heart of *Ranger* is the *lunar capsule.* As the spacecraft nears the moon, the capsule, with its *retro motor,* will separate from it. The rocket motor will fight against the pull of the moon's gravity and slow the capsule enough to let it land without smashing, while the rest of the machine crashes.

The capsule will measure moonquakes and the moon's gravity, radioing its findings.

Earth? Is the moon surface firm enough to support men, or covered deeply with fine dust?

Scientists hope the moon machines will also shed light on how our solar system was formed.

There are two chief ideas about the origin of planets. One says they were pulled from the sun in the form of hot gas when another star passed by too closely.

The other maintains that the planets formed out of a huge mass of cold dust and gas.

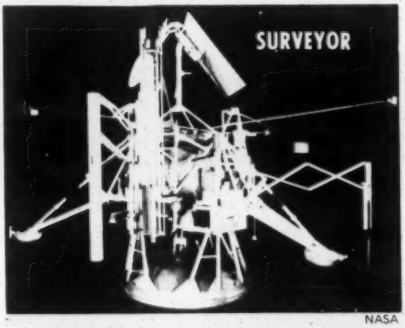
A good clue to this basic riddle will be found when we know whether the moon has a hot liquid core as Earth does.

Earth is large enough so that its own weight could squeeze it so hard that its interior melts heavy metals which flow together to make the core.

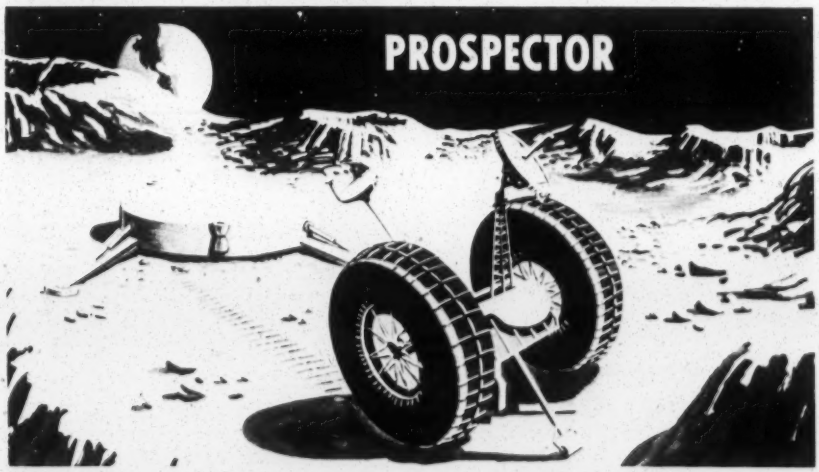
But scientists believe the moon is not big enough to make that much heat. If it has a liquid core, it will be taken as proof that the planets were formed by hot gases. If the moon has no such core, but has its heavy metals scattered throughout, it will be taken as proof of the cold gas theory.

On Earth, we have learned about the core by studying earthquakes. So the first mechanical Columbus we'll send to the moon will be an instrument for detecting moonquakes.

Scientists, and mankind, eagerly await the first reports from the "New World." F.S.



NASA



AFTER RANGER will come these two moon machines. *Surveyor,* left, will have several television cameras, and many instruments to study the materials of the moon. Drills will pluck samples of the moon's insides.

Prospector, below, will roll about to search the moon for possible campsites just before the first men land.

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SPACE CAMERA REVEALS MOON'S SECRET SIDE

ONE GREAT FEAT of man's mechanical explorers was photographing the hidden side of the moon. As it spins around with the world, the moon shows Earth only one side, so no man had ever seen the other half. Our first idea of what it is like came from pictures such as the one above, made by a Russian space probe in 1959.

The black markings indicate mountains and "seas"—large dry plains. The Russians, as the discoverers, have named some of the features—the Sea of Moscow, the Soviet Mountains, the Gulf of Astronauts, and so on. Russia has also hit the moon with a rocket, but its instruments were destroyed in the crash.

BRITISH GUIANA

New Leaders Guide Poor Little Rich Land

Its Premier, a recent visitor to Washington, requests United States Assistance.

BEFORE this August, few people could easily locate British Guiana on a map. Now this small land has taken a prominent place in Western hemisphere affairs and is becoming better known.

In August the colony took a giant step toward independence. A new constitution gave it self-rule in every field except foreign affairs and defense. (The next step will be complete independence from Great Britain.)

The new government drew worried looks on many faces outside British Guiana. The country's premier, Dr. Cheddi B. Jagan, is a socialist, like Cuban Premier Fidel Castro. It is feared he may lead his country, as Castro led Cuba, into alliances with Soviet Russia. This would establish a second Communist country in the Western Hemisphere.

Dr. Jagan, who recently visited the United States, has said he is indeed a socialist, that he plans to put much of Guiana's industry under government control, but that among nations he prefers the role of a neutralist, like India's Nehru, or Indonesia's Sukarno.

Dr. Jagan's country is one of the poor little rich lands of South America. Its forested interior holds great wealth, but few persons have gone beyond the sugar plantations of the coast.

British Guiana is bordered by Venezuela, Brazil, and Surinam. It is larger than the state of Washington, but holds only 566,000 people, only a few more than Seattle. Most live along the narrow coastal strip.

Here on the Demerara River lies Georgetown, a typically British colonial capital. Sprawling wooden Victorian houses thrust out balconies of iron grillwork. White-suited men sip cool drinks on hotel verandas. A Gothic cathedral of wood stands beside a grass-covered square. Red and yellow flowers of tropical plants dazzle the eye.

A modern concrete shopping center competes with street markets for the shillings of the many-hued people: Chinese, East Indian, Negro, and European. Shantytowns, slowly giving way to new apartments, fringe the capital.

Around Georgetown, low land edges the Atlantic Ocean. Here stretch the great sugar plantations. Their centers are like small towns. The factory, which turns cane into rough sugar to be refined in England, is surrounded by row after row of workers' houses, schools, and sometimes a hospital.

Along swampy riverbanks stand small villages of houses raised on stilts to keep the dampness out. Under the houses live

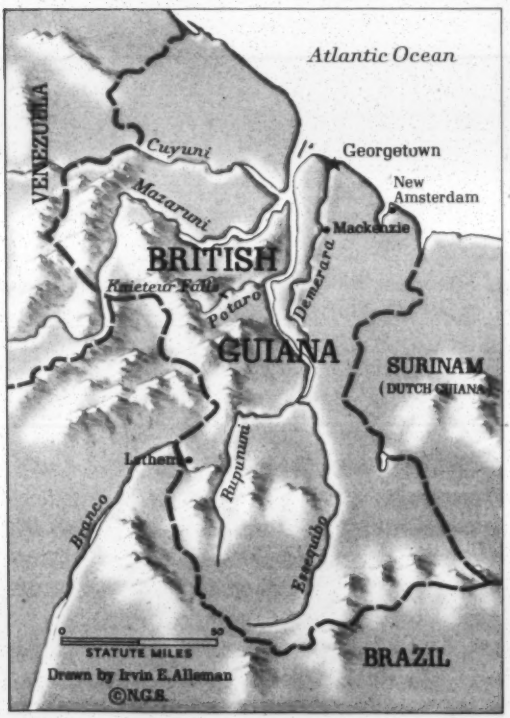
the farmers' pigs, chickens, and goats. Beyond the bank, a few thin cattle graze.

Most Guianese have never been in the vast interior. To them it is a mysterious region of snakes, wild animals, and native Indians —called Amerindians to distinguish them from the many immigrants from India. Some tribes, untouched by civilization, wear big feather headdresses and paint their faces. Ferocious jaguars roam the forests.

A small but steady stream of diamond and gold prospectors goes into the interior from Georgetown. These adventurers try their luck in some remote spot, and if it is good, return to the capital to spend their new wealth.

L. Allen

KAIETEUR FALLS on the Potaro River plunge 741 feet, almost five times as far as Niagara. Much of Guiana resembles the surrounding forest.



BRITISH GUIANA, the only colony Britain ever established in South America, covers 83,000 square miles.

More stable settlements are widely scattered. A few Europeans have built cattle plantations on the grassy savanna along the Rupununi River. At Mackenzie, miners dig bauxite, the ore of aluminum. The northwest produces manganese, used in making steel.

In many places lumbermen harvest the country's abundant supply of fine hardwood.

But only the smallest fragment of the total country has been developed. Much still remains to be done. The world is watching to see how the new premier intends to do it. L.B.

Oregon Schools Replant A Burned-out Forest

PORTLAND, Oregon, school children take regular trips to the countryside to plant trees. Their conservation project will provide jobs and paychecks for their great-grandchildren.

The story began in 1933, long before they were born. The place is Oregon's big Tillamook Forest, as fine a stand of fir, spruce, hemlock, and cedar as the Pacific Northwest could boast.

One sultry August afternoon a cable rubbed against an old stump. Smoke rose. A flame flickered, then hundreds. Before rain and fog drowned it, the huge bonfire consumed a quarter of a million acres of healthy trees.

Oliver W. Matthews

FOREST FIRE sweeps Tillamook Forest in 1933. One small flame turned the area into this mammoth fire within minutes.

WORD OF THE WEEK

Tillamook (tĭl′ ə mo͝ok) n. *An Indian tribe which lived on Oregon's northern coast. Lewis and Clark visited it in 1805-06. In addition to Tillamook Burn, Oregonians remember the tribe in Tillamook (city), Tillamook Bay, Tillamook County, Tillamook River, Tillamook Head, Tillamook Rock, and Tillamook cheese.*

Two more fires—in 1939 and 1945—devastated another hundred thousand acres. Tillamook Forest had become Tillamook Burn. The total timber lost could have built a million and a half homes.

To the Northwest, timber is like oil to Texas or sugar to British Guiana: the chief source of income. Oregonians could not afford to let the woods lie charred and lifeless. They would have to reforest Tillamook Burn.

Reseeding the fire-eaten waste began in 1949. In some areas men distributed seed from helicopters. Wind and wildlife from near-by forests have carried seeds to other places. In some sections hand planting was necessary.

In Portland, a chance talk at a meeting of school officials led the city schools to share the task. Clubs and individuals joined the school group to start the project. Student planting began in 1950.

Originally high school students did the planting. Then in 1958 seventh and eighth grade classes inherited the job.

The State Department of Forestry supplies two-year old Douglas fir seedlings. Individ-

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uals, clubs, and industries pay for chartering busses to and from the Burn—a 95-mile round trip.

When the students arrive, state foresters meet them and show them how and where to plant.

Boy-girl teams do the planting. Using a hoe-shaped tool, the boy digs a hole every six feet. The girl plants the seedlings.

Occasionally student attention wanders to the deer and the beaver dams of Tillamook Burn. The result is a wavering line of trees. However, student-planted trees have survived as well as those put in by professionals.

So far some 150,000 acres of Tillamook Burn have been reforested by school children, Boy Scouts, church groups, clubs, and professionals.

A century from now these seedlings will mature into billions of board feet of good timber. L.B.

CONSERVATION IN ACTION—Two seventh grade students from a Portland school, on a day's outing to Tillamook Burn, get lessons in planting a seedling. Some 1,500 children from the city's elementary schools participate in this project every year.

Trees planted during the early years of the program are now a healthy six or seven feet high.

Photographs from American Forests Magazine

FORESTERS FOR A DAY—Children head for a planting site in Tillamook Burn

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"IT WAS like being back home, out on the High Plains in a Jeep," Dean Conger told me, "except that the cowboys were Mongols, the jeep was Russian, and the grassy plains belonged to Outer Mongolia."

Dean had just returned from photographing Mongolia for the *National Geographic,* and was fuller of his subject than of the lunch we were sharing.

"There is pure grass for miles and miles out there in the middle of Asia [see *Geographic School Bulletin,* October 9, 1961]. We traveled for days and that was all we saw—grass. No patches of sagebrush or weeds such as you see in Wyoming or eastern Colorado where I grew up. Outer Mongolia is practically an untouched country—a lot like our western plains must have looked a century ago, before they were plowed or overgrazed.

"I never saw so many horses. One cooperative farm may have 20,000 horses. The 'cowboys' don't have lariats. They use an *urga,* a noose on the end of a long stick, to take an animal out of the herd. They milk the mares four or five times a day and make *arik,* a fermented drink.

"Mongols also milk camels. They eat a lot of *tarac* (a form of yogurt), mutton, lamb, beef, and camel meat. In the north they depend on reindeer.

"Most of these plainsmen still live in yurts or, to give them their Mongol name, *gehrs.* These tents of skin dot the grasslands (see picture). Occasionally you come to an *aimak* center, a town of a few thousand people which corresponds to our state capitals. But the only city is Ulan Bator, the national capital.

"Outer Mongolia is big—about one-fifth the size of the United States. Transportation is its problem. There is only one railroad and a few highways. But jeepable trails go everywhere and there is very good airline service. The big planes can land almost anywhere, right in the grass.

"Don't get the impression that this is completely the backward country of Genghis Khan. Almost everyone can read or write, whereas in 1921—when they became 'free'—the country was almost completely illiterate. A written language based on Russia's Cyrillic alphabet was adopted in 1946. Everyone goes to school five years, and some stay in for seven or ten years. They go six days a week.

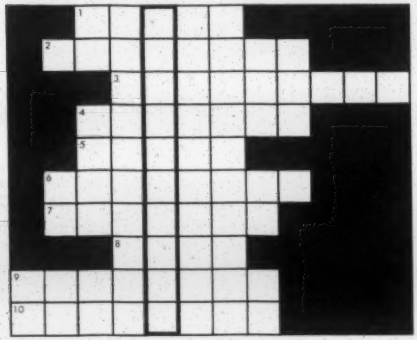
Dean Conger

"Ulan Bator is a modern city in all respects. My hotel room had hot and cold water, rugs on the floor, piped-in music, and good meals. The city has a university, medical school and hospital, academy of sciences, and an agricultural school. One hundred students are studying English in a city which only a handful of English-speaking people have ever visited.

"Some industry is appearing—a shoe

GEO-GRAPH

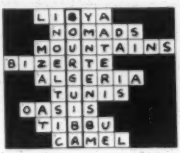
Solve the key word and learn the capital of British Guiana. All words used appear in the Guiana story, pages 68-69.



ACROSS

1. New premier of British Guiana
2. River on which the capital stands
3. New premier's ideology
4. Eastern neighbor of British Guiana
5. Guiana's chief crop
6. Falls five times as high as Niagara
7. Guiana is a _____ colony
8. Prospectors seek _____ in Guiana's interior
9. Guiana has forests of fine _____
10. Cattle plantations sprawl on the _____ savanna

Last week's puzzle



factory, textile plant, tannery, flour mill. There are coal mines and oil enough to supply their needs. But the biggest future is out on the plains. The wild-riding descendants of Genghis Khan's hordes are taking to the truck and jeep (all Russian-made), but still use the camel for short hauls. Irrigation works supply farm cooperatives. The grass is being turned under for grains.

"Water is no problem. There are lots of streams and rivers—full of fish. The Mongol traditionally does not eat fish. Once I thought I had a real photographic oddity—three Mongols fishing. But when I got close, I saw they were Russians.

"The Mongolian Republic is 100 percent a Russian satellite, but no one was unfriendly to me because of my American passport."

Swiss Sing a Different Tune

Switzerland has given up using the British national anthem—after 150 years.

Until recently, the Swiss anthem had been *Rufst du, mein Vaterland* (Callest Thou, Fatherland), sung to the tune of *God Save the Queen.*

Now the government has chosen *Schweizerpsalm* (Swiss Psalm), with native words and music.

Switzerland was not alone in borrowing *God Save the Queen.* At least 20 countries have done so. In the United States, the tune is familiar as *America* which begins, "My country, 'tis of thee. . . ." Music experts believe the tune is the best known one in the world.

The first national anthem was the Netherlands' *Wilhelmus van Nassouwe,* written about 1568. *God Save the Queen* was second, but most influential. The British song inspired many nations with the idea of having their own national songs.

Science has decided that the zebra is a white animal with black stripes, and not a black animal with white stripes.

Calling all Geographers

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Robert F. Sisson

Many Races Salute Old Glory on Pacific Island

By presidential proclamation, the United States celebrates American Education Week November 5 to 11. Have you ever thought how far-flung our American schools are?

Take the low, white three-room school on tiny Canton Island, a remote outpost in the Central Pacific administered by the United States and Britain. The school is operated by the U. S. Department of the Interior.

Children of many races pledge allegiance to the U. S. flag at this school (above). Among the 39 students and two teachers there are people of Japanese, Chinese, Korean, Hawaiian, Polynesian, Micronesian, Filipino, Portuguese, Australian, and English origins.

But they learn the same things you learn in your school. Educational standards are set in Hawaii, original home of many of the islanders.

Life on Canton Island is quite different from life on the United States mainland. You don't go around the corner to the supermarket. You order groceries a month in advance—supplies come from Hawaii once a month.

The reason for anyone at all living on Canton Island is its beacon to guide Pacific-flying planes. Also, the United States recently constructed a satellite tracking station on the island.

On the National Geographic map of the world, Canton Island lies halfway between Hawaii and New Zealand.

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- Moon's Secret Side
- British Guiana
- Oregon Children Reforest

... and other features, including Outer Mongolia, Canton Island

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Assistants—Arthur P. Miller Jr., Frank Sartwell, Katherine Crapster, Liva Baker,

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NEXT WEEK—
American Folk Songs

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